

What is claimed is:

1. A transmission state determination method of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

a displacement sensor that can detect movement of said vehicle body is provided,

said method comprises steps of ;

gradually increasing the intake air amount of said internal combustion engine while a rotational speed of said internal combustion engine is

monitored when said control mode for generating electric power is selected, and

determining that said power transmission device is in the state of transmitting power when said displacement sensor detects movement of said vehicle body in the step of gradually increasing said intake air amount, and that said power transmission device is in the state of cutting power transmission when said displacement sensor does not detect movement of said vehicle body before the rotational speed of said internal combustion engine exceeds a preset reference rotational speed in the step of gradually increasing said intake air amount.

2. A transmission state determination method of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

5 a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle is used as a displacement sensor, and

said method comprises steps of;

10 gradually increasing an intake air amount of said internal combustion engine while a rotational speed of said internal combustion engine is monitored when said control mode for generating electric power is selected, and

15 determining that said power transmission device is in the state of transmitting power when generation of the vehicle speed pulse by said vehicle speed sensor is detected in the process of gradually increasing said intake air amount, and that said power transmission device is in the state of cutting power transmission when generation of the vehicle speed pulse by the vehicle speed sensor is not detected before the rotational speed of said internal combustion engine exceeds a preset reference rotational speed in the
20 process of gradually increasing said intake air amount.

3. A transmission state determination method of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power
25 transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control
5 mode for generating electric power; and

a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said
10 generator when the control mode for generating electric power is selected by said mode selection means,

wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine
15 and said drive wheels, and

a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle is used as a displacement sensor, and

said method comprises steps of;

20 gradually increasing a intake air amount of said internal combustion engine while a rotational speed of said internal combustion engine is monitored when said control mode for generating electric power is selected, and

determining that said power transmission device is in the state of
25 transmitting power when a vehicle speed obtained from said vehicle speed pulse reaches a set determination reference value or higher in the process of gradually increasing said intake air amount, and that said power transmission device is in the state of cutting power transmission when the

vehicle speed obtained from said vehicle speed pulse does not reach said set determination reference value before the rotational speed of said internal combustion engine exceeds a preset reference rotational speed in the process of gradually increasing said intake air amount.

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4. A transmission state determination device of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:

10 an internal combustion engine incorporated in a vehicle body having drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

15 mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by
20 said mode selection means,

wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism
25 and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

said transmission state determination device comprises:

rotational speed detection means for detecting a rotational speed of
said internal combustion engine;

a displacement sensor that detects movement of said vehicle body;

intake air amount control means for determining transmission state for
5 controlling said actuator so as to gradually increase the intake air amount of
said internal combustion engine when the control mode for generating
electric power is selected by said mode selection means; and

determination means for determining that said power transmission
device is in the state of transmitting power when said displacement sensor
10 detects movement of said vehicle body in the process of gradually increasing
said intake air amount by said intake air amount control means for
determining transmission state, and that said power transmission device is
in the state of cutting power transmission when said displacement sensor
does not detect movement of said vehicle body before the rotational speed
15 detected by said rotational speed detection means exceeds a set reference
rotational speed in the process of gradually increasing said intake air
amount.

5. A transmission state determination device of a power transmission
20 device for an internal combustion engine driven vehicle for determining
whether said power transmission device is in a state of cutting power
transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having
drive wheels;

25 an AC generator incorporated in said vehicle body and driven by said
internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

5 a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

10 wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

said transmission state determination device comprises:

15 rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle;

20 intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means; and

determination means for determining that said power transmission device is in the state of transmitting power when said vehicle speed pulse is
25 detected in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in the state of cutting power transmission when said vehicle speed pulse is not detected before the

rotational speed detected by said rotational speed detection means exceeds a reference rotational speed in the process of gradually increasing said intake air amount.

5 6. A transmission state determination device of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having
10 drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control
15 mode for generating electric power; and

a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said
20 generator when the control mode for generating electric power is selected by said mode selection means,

wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine
25 and said drive wheels, and

said transmission state determination device comprises:

rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle;

intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means; and

determination means for determining that said power transmission device is in the state of transmitting power when a vehicle speed obtained from said vehicle speed pulse reaches a set determination reference value or higher in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in the state of cutting power transmission when the vehicle speed obtained from said vehicle speed pulse does not reach said determination reference value before the rotational speed of said internal combustion engine exceeds a predetermined reference rotational speed in the process of gradually increasing said intake air amount.

7. A runaway prevention device of an internal combustion engine driven vehicle for preventing runaway of said internal combustion engine driven vehicle when a control mode for generating electric power is selected, said internal combustion engine driven vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

a power transmission device that has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism that enters a state of transmitting power when a rotational speed of the internal combustion engine reaches a predetermined power transmission

start rotational speed or higher, and is provided between a crankshaft of said internal combustion engine and said drive wheels;

an actuator that operates means for adjusting an intake air amount of said internal combustion engine;

5 an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

10 a generation control unit having rotational speed control means for generating electric power for controlling the intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by
15 said mode selection means,

wherein said runaway prevention device comprises:

rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a displacement sensor that detects movement of said vehicle body;

20 intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means;

determination means for determining that said power transmission
25 device is in a state of transmitting power when said displacement sensor detects movement of said vehicle body in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is

in a state of cutting power transmission when said displacement sensor does not detect movement of said vehicle body before the rotational speed detected by said rotational speed detection means exceeds a set reference rotational speed in the process of gradually increasing said intake air amount; and

5 safety means for controlling said internal combustion engine so as to return the rotational speed of said internal combustion engine to a rotational speed less than said power transmission start rotational speed or to stop said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

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8. The runaway prevention device of the internal combustion engine driven vehicle according to claim 7, wherein said safety means is comprised of means for controlling said actuator so as to return said intake air amount to an idle air amount when said determination means determines that said
15 power transmission device is in the state of transmitting power.

9. The runaway prevention device of the internal combustion engine driven vehicle according to claim 7, wherein said safety means is comprised of means for stopping an ignition operation of said internal combustion engine
20 when said determination means determines that said power transmission device is in the state of transmitting power.

10. The runaway prevention device of the internal combustion engine driven vehicle according to claim 7, wherein said safety means is comprised of
25 means for stopping supply of fuel to said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

11. A runaway prevention device of an internal combustion engine driven vehicle for preventing runaway of said internal combustion engine driven vehicle when a control mode for generating electric power is selected, said internal combustion engine driven vehicle comprising:

5 an internal combustion engine incorporated in a vehicle body having drive wheels;

 a power transmission device that has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism that enters a state of transmitting power when a rotational speed of the
10 internal combustion engine reaches a predetermined power transmission start rotational speed or higher, and is provided between a crankshaft of said internal combustion engine and said drive wheels;

 an actuator that operates means for adjusting an intake air amount of said internal combustion engine;

15 an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

 mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

20 a generation control unit having rotational speed control means for generating electric power for controlling the intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by
25 said mode selection means,

 wherein said runaway prevention device comprises:

 rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a plurality of vehicle speed pulses for one rotation of an axle of said vehicle;

intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means;

determination means for determining that said power transmission device is in a state of transmitting power when said vehicle speed pulses are detected in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in a state of cutting power transmission when said vehicle speed pulses are not detected before the rotational speed detected by said rotational speed detection means exceeds a set reference rotational speed in the process of gradually increasing said intake air amount; and

safety means for controlling said internal combustion engine so as to return the rotational speed of said internal combustion engine to a rotational speed less than said power transmission start rotational speed or to stop said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

12. The runaway prevention device of the internal combustion engine driven vehicle according to claim 11, wherein said safety means is comprised of means for controlling said actuator so as to return said intake air amount to an idle air amount when said determination means determines that said power transmission device is in the state of transmitting power.

13. The runaway prevention device of the internal combustion engine driven vehicle according to claim 11, wherein said safety means is comprised of means for stopping an ignition operation of said internal combustion engine when said determination means determines that said power
5 transmission device is in the state of transmitting power.

14. The runaway prevention device of the internal combustion engine driven vehicle according to claim 11, wherein said safety means is comprised of means for stopping supply of fuel to said internal combustion engine when
10 said determination means determines that said power transmission device is in the state of transmitting power.

15. A runaway prevention device of an internal combustion engine driven vehicle for preventing runaway of said internal combustion engine driven
15 vehicle when a control mode for generating electric power is selected, said internal combustion engine driven vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

a power transmission device that has a transmission with a gear
20 position for cutting power transmission and an automatic clutch mechanism that enters a state of transmitting power when a rotational speed of the internal combustion engine reaches a predetermined power transmission start rotational speed or higher, and is provided between a crankshaft of said internal combustion engine and said drive wheels;

25 an actuator that operates means for adjusting an intake air amount of said internal combustion engine;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

a generation control unit having rotational speed control means for
5 generating electric power for controlling the intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

10 wherein said runaway prevention device comprises:

rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a plurality of vehicle speed pulses for one rotation of an axle of said vehicle;

15 intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means;

determination means for determining that said power transmission
20 device is in a state of transmitting power when a vehicle speed obtained from said vehicle speed pulses reaches a set determination reference value or higher in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in a state of cutting power
25 transmission when the vehicle speed obtained from the vehicle speed pulses does not reach said determination reference value before the rotational speed of said internal combustion engine exceeds a predetermined reference rotational speed; and

safety means for controlling said internal combustion engine so as to return the rotational speed of said internal combustion engine to a rotational speed less than said power transmission start rotational speed or to stop said internal combustion engine when said determination means determines that
5 said power transmission device is in the state of transmitting power.

16. The runaway prevention device of an internal combustion engine driven vehicle according to claim 15, wherein said safety means is comprised of means for controlling said actuator so as to return said intake air amount
10 to an idle air amount when said determination means determines that said power transmission device is in the state of transmitting power.

17. The runaway prevention device of an internal combustion engine driven vehicle according to claim 15, wherein said safety means is comprised
15 of means for stopping an ignition operation of said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

18. The runaway prevention device of an internal combustion engine
20 driven vehicle according to claim 15, wherein said safety means is comprised of means for stopping supply of fuel to said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.